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THE SENSES OF SMELL AND TASTE.

BY MR. NORTON FOLSOM. AN ESSAY TO WHICH THE PRIZE OF THE BOYLSTON MEDICAL SOCIETY WAS AWARDED.

[Communicated for the Boston Medical and Surgical Journal.]

THESE senses are so mingled in action, that their separate offices are at first difficult to determine; and even the exact locality of the perceptions which constitute the two senses can hardly be pointed out without careful observation. We instinctively know that we smell odoriferous substances when they are presented to the nose, and that we taste sapid substances in the mouth, but more than this we can only derive from experiment.

The anatomy of the mouth and nose is briefly as follows: The mouth is an oblong cavity, with an arched roof, lined with mucous membrane, and opening into the pharynx through the arches of the palate. It contains the tongue, which is a muscular organ, capable of applying itself to any part of the mouth, and covered also with mucous membrane, which presents, on the dorsal aspect, three kinds of papillæ; first, the circumvallate, seven to fifteen in number, about one fourth of an inch in diameter, soft, and arranged in the form of the letter V at the root of the organ; second, the fungiform, soft, but much smaller than the circumvallate, distributed irregularly over the dorsum, but much more numerous at the tip and edges; and third, the filiform, very minute, and quite hard and stiff, covering the whole upper surface, between the other papillæ. The epithelium of the circumvallate and fungiform varieties is very thin, that of the filiform quite thick and tough.

The hard palate is the roof of the mouth. Attached to its posterior border, and hanging like a veil or curtain between the mouth and pharynx, is the soft palate, which is muscular, and capable of being applied to the posterior wall of the pharynx, so as to entirely separate the cavities of the nose and the mouth.

The pharynx is the upper extremity of the œsophagus, and opens above into the posterior nares. These parts are all covered with mucous membrane, continuous with that of the mouth, and, like it, consisting of the laminated pavement-epithelium.

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The nose consists of two pyramidal cavities, opening externally in front, and into the pharynx behind. They are entirely separated by a cartilaginous septum. Each cavity is partially divided by three spongy bones into three passages, called respectively the superior, middle, and inferior meatus. All these parts are covered with mucous membrane, which differs in character, however, in different localities. As far down as the middle spongy bone, the epithelium is of the "squamoso cylinder" variety, not ciliated, and the membrane is thick and brownish. Below this, and as far posteriorly as the orifice of the Eustachian tube, the epithelium is ciliated, exactly like that of the larynx and trachea, from which we might infer that this lower portion of the cavity is associated with the respiratory function rather than with special sensation, as is indeed the case.

The nearly-closed cavities communicating with the nostrils, namely, the ethmoidal cells, the sphenoidal and frontal sinuses, and the antrum of Highmore, have no connection with the sense of smell, as has been repeatedly demonstrated by experiment in regard to the two last mentioned.†

The nerves distributed to these organs are as follows:

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| To the nose, | { | <ol style="list-style-type: none"> 1. The olfactory. 2. Branches of the first and second divisions of the trifacial. 3. Branches from the sphenopalatine ganglion of the sympathetic. |
| To the mouth, | { | <ol style="list-style-type: none"> 1. Branches of the third division of the trifacial. 2. The glosso-pharyngeal. 3. The hypo-glossal. 4. Branches from the sphenopalatine and otic ganglions. |

The olfactory nerves, within the cranium, arise from the base of the brain, and rest upon the cribriform plate of the ethmoid bone, which is immediately over the superior spongy bone. From it arise filaments, which descend upon the septum and upon the superior and middle spongy bones, and cannot be traced farther down than the non-ciliated mucous membrane extends. They differ from ordinary nerve-fibres in wanting the axis-cylinder, and in their gelatinous consistency and gray color. They terminate, according to late investigators, in club-shaped bodies, lying immediately beneath the epithelium, which are presumed to be ganglion-cells, like those which constitute the gray cerebral matter.‡

The nasal branches of the first and second divisions of the trifacial supply the mucous membrane of the nose throughout.

* Kolliker. Human Microscopical Anatomy.

† J. Muller. Elements of Physiology.

‡ Oehl, as quoted in the Year Book of the New Sydenham Society for 1859.

Ecker, as quoted by Schroeder Van der Kolk in researches "on the Spinal Cord and Medulla Oblongata."

The spheno-palatine and otic ganglions send branches to the nasal mucous membrane, and also to the muscles of the soft palate.

The branches of the third division of the trifacial supply the mucous membrane of the mouth, and a large trunk called the gustatory nerve is distributed to the anterior two-thirds of the dorsum of the tongue, where its fibres enter the fungiform papillæ.

The glosso-pharyngeal nerve supplies the muscles and mucous membrane of the pharynx and base of the tongue, and a branch passes forward to the circumvallate papillæ, where it forms a considerable plexus in each of them.

The hypo-glossal is distributed exclusively to the muscles of the tongue.

In a morphological point of view, the olfactory apparatus is to be considered as a cerebral ganglion, belonging, with the eye and the ear, to a series of three organs of special sense, which are disposed in the intervals between the four cranial vertebræ. Their nerves differ from ordinary nerves in having ganglion-cells, or gray matter, at their peripheral extremities, namely, the olfactory filaments, the retina, and the cochlear and vestibular branches of the auditory nerve. This view is corroborated by the original development of these nerves or ganglions, which grow out from the cerebral substance, instead of being formed *in situ*, as all other nerves are.

In considering the functions of these various nerves, we may exclude the fibres from the sympathetic (believing them only to govern the nutrition of the parts, and to cause certain involuntary movements of the palate), and the hypo-glossal, which is the motor of the tongue.

When a substance to be tasted is placed in the mouth, we press it with the upper surface of the tongue against the palate, and thus force its particles in every direction. The saliva, poured in by its glands responsive to the stimulus, aids in dissolving and disseminating the particles over the mouth. When the substance reaches the fauces, and as it is swallowed, a current of air escapes from the glottis and carries any volatile portion to the posterior nares, where it is liable to affect the sense of smell. Plainly, therefore, in order to separate the two sensations, we must either shut off the cavity of the nose during the tasting, which can be done by most persons voluntarily by breathing through the mouth and applying the soft palate to the back of the pharynx, or we must interrupt the current of air through the nares, which can be done by holding the nose with the fingers.

We recognize two classes of impressions made by articles of food—one of *savors*, of which salt affords an example; the other of *flavors*, as that of vanilla. Most substances have both properties; thus a strawberry has an acid and a sweet taste, besides its own delicious flavor.

The distinction between these two classes has not, indeed, been fully made by physiologists until of late; and still less has the fact been recognized, that *all flavors are perceived by the organ of smell only*, reducing the number of impressions which the organ of *taste* is capable of receiving to four only, viz., Sweet, Sour, Salt, and Bitter. This can, however, be easily and certainly demonstrated. Let the nose be closed by the fingers, or let the posterior nares be shut off by the soft palate, and a solution of vanilla be taken into the mouth and swallowed. It cannot be distinguished from water. Soup, nutmeg, cheese, pineapple, and assafoetida are alike entirely *flavorless* under similar conditions, though the *ordinary sensibility* of the mucous membrane, and the perception of the four savors above mentioned, may enable us to apprehend certain *other* qualities which distinguish these substances. The common practice of holding a child's nose while it swallows disagreeable medicine, has its origin in this peculiar relation of these two senses.

We have now to consider the exact locality of the sensations produced by these four classes of stimuli. Experiments have been tried by various physiologists with entirely different results, which may be attributed to want of care and to not recognizing the fact that all *flavors* should be excluded from the investigation. All agree, however, in this—that, to be tasted, a substance must be brought to the sensitive part *in solution*, inasmuch as insoluble substances have no taste.

In the experiments performed by the writer, solutions of white sugar, tartaric acid, common salt, and sulphate of quinine, were carefully applied to various parts of the mouth and fauces by means of a camel's-hair pencil, pains being taken that no excess of fluid should be used, which might diffuse itself over other parts than that directly under observation. The following results were uniformly obtained on six different individuals, they all being unaware of the substances used in each experiment.

1st. The upper surface, tip, and edges of the tongue, as far back as to include the circumvallate papillæ, are the *only* parts concerned in the sense of taste; the hard and soft palate, tonsils, pharynx, lips, gums, and under surface of the tongue being entirely destitute of this sense.

2d. The circumvallate papillæ are far the most sensitive portion of the organ. They perceive, at once, very minute quantities of any one of the four substances used, and are particularly sensitive to bitter. Irritation of these papillæ by pressure, or placing a drop of cold water on them, excites decided sensations of bitterness.

3d. The central portion of the dorsum of the tongue, to within half an inch of the edge, is the least sensitive portion. Substances are distinguished with difficulty, or not at all, when applied to it.

4th. The edges and tip of the tongue are quite sensitive, the

edges becoming less so as we come forward. They recognize all the four classes of substances. The tip detects bitter with great difficulty, but is particularly sensitive to sweet. A sweet sensation, sometimes mingled with sour or salt, is produced by gently tapping it with any insipid soft substance.

The tongue possesses *ordinary sensibility* to a marked degree, especially at its tip, and in this way detects the size, shape, and texture of substances. It is in the same way that the qualities of pungency and astringency are perceived, which fact is proved by their being nearly as perceptible to the conjunctiva, or any other mucous membrane possessing ordinary sensibility, as to the mouth. A solution of tannin, applied to the circumvallate papillæ, gives the sensation of extreme bitterness, while at the tip it produces a slight sweetish taste, especially after it has been washed off by the saliva. These sensations are entirely distinct from the puckering, which, as just said, is perceived by other mucous membranes. The application of a solution of potassa gives nearly the same result, proving that there is no such thing as a distinct alkaline taste.

The results of the experiments of the present writer differ from those of a recent authority,* who states that the hard and soft palate possess the sense of taste to a considerable degree. It is difficult to prevent fluids applied to these parts from trickling down upon the tongue; but if this is guarded against, no sensation is produced, even by a strong solution of a sapid substance, except that of stimulation.

These facts make it almost certain that the gustatory branch of the trifacial, through the fungiform, and the anterior branch of the glosso-pharyngeal, through the circumvallate papillæ, share the office of tasting between them. This is also proved by cases where the sense of taste has been lost in the anterior part of the tongue, by the paralysis of the trifacial nerve, while it continued unimpaired at the root.†

We should hardly expect to find this similarity of action between two distinct nerves, especially as the whole of the trifacial, with the exception of the gustatory branch, is a nerve of ordinary sensation. But it is shown by recent microscopic investigation, that the sensitive root of the trifacial nerve receives certain fibres from the root of the glosso-pharyngeal in the substance of the medulla oblongata,‡ and it is at least *possible* that these fibres may enter the lower division, and be distributed with the gustatory branch, thus giving it the power of tasting.

These nerves do not differ in structure from the nerves of ordinary sensation, and yet would seem to perform the office of special

* Drielsma, as quoted in the Year Book of the New Sydenham Society for 1860.

† Todd and Bowman. Physiology.

‡ Schroeder Van der Kolk, in researches "on the Spinal Cord and Medulla Oblongata."—New Sydenham Society. 1859.

sense. But tasting is, as we have seen, a much simpler action than at first appears, and should rather be classed with the functions of hunger, thirst, satiety, nausea, and the distress which is felt impelling us to breathe when respiration is suspended, (functions performed by the pneumogastric,) than with the higher and more complicated special senses. In connection with this, we may notice that, morphologically, the glosso-pharyngeal and pneumogastric belong to the same pair of cranial nerves.

Certain substances have been observed to produce sensations, painful or otherwise, when applied to perfectly sound teeth. As it has been ascertained that fluids are readily and rapidly absorbed by the tubules of the dental structure, and conveyed to the pulp cavity,* it is highly probable that the sensation is excited at the latter organ.

The sense of smell is entirely performed by the olfactory nerve. This is proved by the corresponding increase of the relative size of the nerve in those animals which are known to possess a particularly acute power of scent, and also by the fact that in paralysis of the trifacial the sense remains unimpaired. The branches of the trifacial which are distributed to the mucous membrane of the lower and anterior parts of the nasal cavity, endow it with a high degree of *common sensibility*, so as to guard the more delicate part of the organ from injury, by giving warning if we attempt to inhale any irritating vapor. This common sensibility appreciates the pungency of substances in the same way as in the case of any other mucous membrane. Many substances possess pungency beside odor, as ammonia and mustard, for example. These affect the conjunctiva almost as readily as the nose.

The organ of smell is affected by substances only when they are in the form of vapor; hence non-volatile substances have no smell. Vapors reach the organ in two ways. In the first place, a current of air may be drawn, by a forcible inspiration, so as to be directed by the external nose to the upper part of its cavity, and impinge upon the filaments of the olfactory nerve. If this air contains particles of any volatile substance, it gives rise to the sensation which we call *odor*. In the second place, if any volatile substance is taken into the mouth, and carried to the fauces, or swallowed, and a puff of air is allowed to escape from the larynx, it will be directed by the walls of the pharynx, so as to carry the particles of the substance directly to the upper part of the nares, where it produces what we describe as *flavor*. We unconsciously emit this current of air, immediately after swallowing, and when we are trying to taste anything. Thus we see that "scent and flavor are the same impression on the same nerve at the same part."†

Flavors are connected, in a great majority of instances, with food. This is the reason that the smell of roast meat so strongly

* Dr. Miel, a dentist, as quoted by Todd and Bowman.

† Herbert Mayo. *The Nervous System and its Functions*. 1842.

excites the appetite of a hungry man. The exercise of the sense of taste is simultaneous with that of smell, in the act of eating, which accounts for the difficulty of distinguishing between them.

We can only classify these perceptions so far as to say that they are agreeable or disagreeable. Even this distinction cannot always be made; thus the faint smell of putrid urine closely resembles that of sandal-wood. What is offensive to one person may be pleasant to another. The desire for certain flavors is entirely acquired, and the infant will reject with loathing what may become its favorite food in after life. An agreeable flavor or odor sometimes becomes disagreeable by long continuance.

The odors of substances which are similar in other respects are generally alike, so that we may attempt to classify them according to the sources from which they are derived. The smells of plants are nearly, if not quite all, derived from essential oils. The various ethers have kindred odors.

Substances differ as to the intensity of their odor without reference to their volatility. Thus the smell of musk is more intense than that of ether.

In man, this sense only serves the purpose of giving him pleasure, and guides him to a slight extent in the choice of food; but with the lower animals, it not only becomes necessary in the detection and selection of food, but warns of the approach of friends or enemies, and performs numerous other duties, sometimes attaining a delicacy which renders it nearly equal in rank to sight and hearing. The hunting-dog and the antelope are well-known examples of this. The sexual appetite is frequently excited through this sense.

But in man, this sense is not commonly developed to its fullest possible extent. It is well known that the senses possess a certain sort of compensating power; that is, if one is lost, the others become more acute. The capabilities of this sense in the human being are well exemplified by the case of James Mitchell, who was blind, deaf and dumb from birth, and distinguished between persons principally by smell. It enabled him to detect the entrance of a stranger at once.*

It is recorded of the wine-tasters of Spain, that they can distinguish between five hundred different kinds of wine; and instances are familiar to every one, of the faculty of telling several kinds of wine, or several varieties of the same kind, many times in succession, with the eyes covered. A well-known gentleman of Boston is an example.

The tea-tasters to be found in great commercial cities acquire very nice discriminating powers, frequently determining the investment of large sums of money by merely tasting a specimen of tea.

Persons accustomed to the use of tobacco can at once distinguish

* Carpenter. Human Physiology.

the variety brought from Havana, and even, in some instances, the particular plantation from which it comes.

The French cultivate the olfactory sense to a much greater extent than most other nations, not only in the art of perfumery, but in cookery, which becomes almost a fine art with them; and there seems to be no reason why the imagination should not be reached through this organ as well as through the eye and the ear. The scent of the freshly-opened rose, or the flavor of the strawberry, has as valid a claim to the notice of the poet as the song of the lark, or the beauty of sunset. At all events, much pleasure and practical advantage might be gained by its systematic cultivation, even if we should never rival the powers of "the Monk of Prague, mentioned in the Journal of the Learned of the Year 1684."

"He not only knew different Persons by the Smell, but, what is much more singular, could, we are told, distinguish a chaste Woman, married or unmarried, from one that was not so. This Religious had begun to write a new Treatise on Odours, when he died, very much lamented by the Gentlemen who record this Story of him. For my Part, I do not know whether a Man of such Talents would not have been dangerous to Society." *

CONSTITUTIONAL SYPHILIS.

[Read before the Suffolk District Med. Society, and communicated for the Boston Med. and Surg. Journal.]

By A. D. SINCLAIR, M.D.

MR. ——— contracted a hard chancre early in February, 1861, and in ten or twelve days from its appearance on the penis near the frænum, was put under mercurial treatment, which was continued regularly for about three months; the specific effect of the drug upon the gums having been produced two or three times. He was advised to continue the treatment still longer, but supposing himself relieved from his trouble, there being no visible trace of disease remaining, left off taking medicine, and in a few weeks, as I afterwards ascertained, married. This occurred in June, or between four and five months from the period of infection.

His wife, previous to marriage, was an exceedingly healthy woman, about twenty-four years of age. She soon afterwards became pregnant, and aborted about the end of September following:

She applied to me on the 21st of October, for relief from neuralgic pains about the head and body, which had continued very severe for two or three weeks. She had lost flesh and strength. Being asked as to the presence of any cutaneous eruptions, she gave an affirmative answer; several roseolar blotches were found upon the extremities, and an excoriation or erosion of a portion of the mu-

* Le Cat. A Physical Essay on the Senses. 1750.

cous membrane of the right labium. She was directed an eighth of a grain of the bichloride of mercury thrice daily in solution, and requested to report herself from time to time. But when the eruption disappeared and the general health improved, she could not understand why treatment should be longer continued. It was therefore dropped.

In February, 1862, she had a severe attack of scarlet fever. Very soon after recovery from this she was seized with iritis, which was being effectually combated, but, through the advice of friends, the case was turned over to an oculist.

From this time (March), I lost sight of her till the middle of November, when I was sent for in great haste. I found her between seven and eight months advanced in pregnancy. The waters were slowly flowing from the vagina; no labor pains, nor had there been any; breech presenting and high up; cervix flabby. Nothing was done. In thirty-six hours I was again called, and soon after my arrival a dead fœtus was expelled. It looked sodden, the skin peeling off on slight effort, and exhaled, as usual in such cases, a very offensive odor. She made an excellent recovery.

In answer to inquiry, said that she had had occasional blotches of her "humor." Two or three faded spots were observed upon the thighs.

I am quite satisfied that the husband had no primary nor secondary lesion of the surface by which his wife could have been directly inoculated; that on the other hand his wife was not illicitly infected. It is therefore reasonable to conclude that this woman became infected through the embryo in utero; the ovum being fertilized by the vitiated seminal fluid of the man. Abortion took place early after her first conception, and immediately afterwards secondary symptoms became very marked. After a lapse of six months she again became pregnant, and miscarried between the seventh and eighth month of utero-gestation. Her limbs at this time showed the presence of constitutional syphilis.

OCCLUSION OF THE PYLORIC ORIFICE OF THE STOMACH BY A MALIGNANT GROWTH IN THE RIGHT LOBE OF THE LIVER.

BY SAMUEL P. FRENCH, M.D.

[Communicated for the Boston Medical and Surgical Journal.]

Mrs. G., of Royalston, Mass., aged 56, mother of two children, of robust constitution, above medium size, observed, five years ago, a small tumor in the right hypochondrium. She has enjoyed good health till within a year; the past year it has been miserable. She has had more or less pain in the left shoulder, has suffered much from indigestion, and has had slight tenderness in the region of the tumor.

I saw her for the first time on the 25th of January last. She was then attacked with vomiting, accompanied by great thirst and severe pain in the stomach. Her skin was yellowish white, pulse quick and weak. I examined the tumor. It was large and hard, situated a little above and to the right of the umbilicus, and extending upwards and outwards under the short ribs. *Diagnosis*—cancer of the right lobe of the liver.

As there was considerable tenderness near the pyloric orifice of the stomach, I applied a blister, which diminished the tenderness. The vomiting was allayed by small doses of calomel and morphine; the bowels were moved by repeated Seidlitz powders and injections. In a week, she was much relieved, and began to have an appetite. She then took sarsaparilla syrup, with iodide of potassium, and carbonate of ammonia. For a fortnight she was quite comfortable, and gained strength, but subsequently she was attacked with more violent vomiting, with greater thirst and distress than at first. The matter vomited was dark-colored, like coffee-grounds. The extremities were cold, the pulse frequent and weak; she lay constantly in a semi-flexed position, knees drawn up towards the bowels, the head and chest inclined over the stomach. Anodynes and creasote were tried, but had no effect. She obtained some ease from injections composed of morphine two thirds of a grain, broth and whiskey each one ounce. The vomiting continued one week, every two or three hours, and ceased about thirty-three hours before death. She then complained of great fulness and distress in her stomach. As she had not urinated for four days, I drew off her water, but could obtain only half a pint. Death finally relieved her of her sufferings.

Autopsy, twenty-four hours after death. Bowels much enlarged. On opening the abdomen, the liver was found to be twice as large as natural—the left lobe extending across the left hypochondrium, the right as low down as the umbilicus. The lower part of the right lobe was one solid mass of cancerous deposition, agglutinated to and completely surrounding the pyloric extremity of the stomach, implicating the pancreas and the contiguous mesenteric glands. The tumor was nearly spherical, about three inches in diameter, and lobulated. It was white, like the medullary substance of the brain, undoubtedly medullary cancer. The remaining part of the right and the whole of the left lobe were interspersed with white tumors as large as peas. The peritoneum was inflamed, but contained no serum. The stomach was enormously distended, extending to the ilea. I opened it, and removed from it one gallon of dark-colored liquid. I cut down to the pylorus, and found it completely compressed by the before-mentioned malignant growth. No cancerous depositions could be found in the mucous membrane of the stomach.

Cancer of the liver and of the stomach separately is frequent, but cancer implicating the liver, stomach and pancreas, and com-

pletely closing up by compression the pylorus of the stomach, is rare.

Richmond, N. H., April 13, 1863.

THE CINCHONA FORESTS OF SOUTH AMERICA.*

By DR. KARL SCHERZER.

WHEN the frigate Novara left Batavia, I cherished the hope that our stay in South America would be sufficiently long to allow of undertaking a journey to the cinchona forests; and to be able to answer, through personal observation, certain questions, entrusted to us by Dr. Junghuhn, of Lembang, in regard to the conditions essential to the growth of the species of cinchona cultivated in Java. Instead, however, of the expedition as originally planned, it was only allowed me to tread the classic soil where Humboldt gathered the first scientific treasures; and this only for so short a time, that my visit had to be limited to the capital of Peru and its immediate neighborhood. A scientific excursion to the cinchona forests lying far in the interior was out of the question, under the existing circumstances. I did not neglect, however, to translate the inquiries confided to me by Dr. Junghuhn into the English and Spanish languages, and to forward copies of these interesting desiderata to such persons in Chili, Peru and Bolivia, who, from their mercantile position, or their interest in scientific discussions, seemed to be able to contribute towards deciding several questions respecting the growth of the cinchona in its native country. I took pains, at the same time, to collect for myself information on this subject, as often as opportunity offered, and by a very fortunate accident (as it appeared to me) I met in Lima Mr. Campbell, a merchant of Bolivia, who for many years has been living in Tacna, and has paid particular attention to the cinchona trade. For the chief export of this important drug is from Bolivia, and not from Peru, as its commercial name, "*Peruvian bark*," might lead one to suppose. This designation dates from the time when the Bolivia of to-day (in whose forests the cinchona chiefly grows) was an integral part of Peru, and was called Upper Peru; while from the present republic of Peru scarcely any Peruvian bark is exported, and that collected in New Grenada and Ecuador, and known under the name of Pitaya bark, is of a quality far inferior for medicinal purposes.

The most important fact which I am at present able to communicate is in correction of a wide-spread error, that by the greed of gain the extermination of the cinchona tree in its native home is

* From the Voyage of the Austrian Frigate Novara around the Earth, in 1857, 1858 and 1859. Vienna, 1862.

near at hand, and that the supply of the remedial agent derived from its bark, which has become to the practising physician as indispensable as the Peruvian potato is to the working classes, will soon no longer suffice for its daily-increasing use. The Calisaya region (i. e., in which the Cinchona Calisaya, whose bark is most prized and valuable, occurs most abundantly and thrives best) stretches from one degree north of Lake Titicaca to the twentieth degree of south latitude. In the forests of Cochabamba, viz., between this point and La Paz, the cinchona occurs more abundantly than in those forests lying parallel to La Paz, in which it is now found only at such a distance from the city that the cost of transportation through the wilderness amounts to 17 pesos per hundred weight. The forests lying more southerly, on the contrary, are still untouched by the axe of the *cascarilleros*. The largest proportion is exported from Tacna and Arica; a small quantity only, suspected of being contraband, goes northward from Lake Titicaca, in order to be shipped through Port d'Islay.

From the district above mentioned 8 to 10,000 hundred-weight of bark could be gathered annually for an indefinite period, without the least danger of exterminating the tree. Since 1845 the export of cinchona bark from Bolivia has been a monopoly of the government, which conveyed the right to a company which bound itself under a certain sum to the yearly export of 4000 hundred-weight.

This company paid the *cascarilleros*, or persons who gathered the bark in the cinchona forests, 25 to 30 pesos, for every hundred-weight of Calisaya bark delivered in La Paz, the chief city of Bolivia. But this arrangement had but partial success, for speculation and avarice, as well as the continual political unsettlement and alterations in the government of the country, stood in the way of the quiet development of this branch of industry and trade. Each new president wished to draw the greatest possible gain from the natural treasures of the soil, and the sum demanded for the right to export the cinchona bark constantly advanced. In 1850, a native mercantile house in La Paz paid to the bark gatherers 60 pesos for every hundred-weight, besides an export tax to the government of 25 pesos per hundred-weight, while the contractors bound themselves to a yearly collection and export of 7000 hundred-weight. The exorbitant price paid to the *cascarilleros* occasioned an enormous quantity of Calisaya bark to be brought to La Paz. In order to restore the average, and not to fill the market far beyond the demand, the government now prohibited the cutting and gathering of the cinchona bark. Within eighteen months 18,000 hundred-weight had been delivered, and this circumstance caused such a fright among the monopolists that they declared themselves bankrupt, and were only spared from complete ruin by the moderation of the government, which took possession of the whole stock, paid the

speculators with certificates, redeemable in certain periods, and concluded a new contract with a native mercantile house, in which the selling price of an hundred-weight of bark delivered in La Paz was limited to 65 pesos clear of further export duty.

As soon as the present stock is exhausted, it is probable that the prohibition on the cutting of the Calisaya bark will be again withdrawn, and by the serious lesson learned in the mean time, the excessive and dangerous eagerness of the *cascarilleros* for collecting may be prevented.

My visit in Java was just at the time when chemical experiments were being tried on the bark of the young cinchona trees, and the fact that in these the costly alkaloid was not found, excited the apprehension that the bark of these trees, cultivated with such great care, would perhaps be entirely destitute in the land of their adoption—under altered climatic and geognostical circumstances—of their most valuable constituent. But the information obtained by me in South America shows that even in its native home the quinia is met with only in the bark of the older trees, and its quantity bears a proportion to the age of the branch. The bark of the trees which are 50 years and more in age are richest in quinia. To the ignorance of this fact must probably be attributed the annual felling by the cinchona-gatherers, or cinchona-hunters (*Cazadores de Quina*) during the time of the Spanish rule, of 800 to 900 cinchona trees of 4 or 5 years of age, in order to obtain the 110 hundred-weight of bark which was sent from Payta around Cape Horn to Cadiz, exclusively for the use of the royal court.

In reference also to the quantities annually exported from South America, and consumed in European preparations, very considerable errors have crept in, even in scientific circles.

The total export of cinchona from South America, from 1830 to 1860, has not exceeded, according to reliable accounts, 200,000 hundred-weight* (the seven inferior kinds not included), while of Calisaya, the real red bark (*cascarilla roja*), certainly not more than 120,000 hundred-weight has been sent abroad. While thus the yearly export of Peruvian bark appears to be far less than is generally supposed, a species of cinchona has lately for the first time been discovered in the forests of Bolivia, between Tarija, Cochabamba and La Paz, whose bark is said to possess the same characteristics as that of the *Cinchona calisaya*. The curate of Tarija has offered for sale nearly 3000 hundred-weight of this valuable bark (called *Sucupira* by the Indians). The position of the forests is so favorable for export, that the freight from Tarija to Iquique, the nearest seaport, is but from 8 to 10 pesos per hundred-weight.

Upon referring to these communications, and to the not incon-

* Weddell, on the contrary, states that one manufactory, that of Pelletier, Delondre and Levaillaux, in Havre, had used in one year (1837) not less than 17,400,000 hundred-weight of the best cinchona bark in the production of quinia. This is either a typographical error, or a colossal exaggeration.

siderable increase which has resulted from the successful propagation of the cinchona in Java and the East Indies, all apprehension may disappear that this noble tree is nearly exterminated, and suffering humanity threatened, by ignorance and vandalism, of being deprived of one of the most active and important of the physician's remedies.—*American Journal of Pharmacy*, from *Vierteljahresschrift für Praktische Pharmacie*, Bd. xii., H. I.

ON PURE PEPSIN.

BY M. BRÜCKE.

PEPSIN can be precipitated from its solutions by agitation with cholesterin, phosphate of lime, or animal black; dissolved in water containing phosphoric acid, it can also be precipitated when neutralized with lime water, and is contained in the precipitate of phosphate of lime without being in combination with that salt.

On these facts, M. Brücke has based a new process for the preparation of this important substance; he has obtained it in a state of purity unknown to this time, and which permits him to rectify a good number of statements in regard to it in the treatises.

Two recent hogs' stomachs are digested in weak phosphoric acid, at the temperature of 100 F., which detaches the mucous coat in fragments. The solution is filtered, and the residue again digested at the same temperature. The filtrate should be clear, and yellow prussiate should not indicate albumen. Lime water is now added until the neutralization is nearly complete as tested by litmus, the precipitate collected, expressed, and dissolved in water containing hydrochloric acid. The clear solution is again precipitated by lime water, redissolved by hydrochloric acid, and filtered.

Into a flask, sufficiently large to contain the liquid, a funnel with a long beak is introduced, and into it a solution of cholesterin, prepared cold, with a mixture formed of four parts of alcohol of 94 per cent. and one part of ether. By contact with the acid liquid the cholesterin separates in very fine particles and rises to the top of the liquid; when the coagulum acquires the thickness of about two centimetres, the funnel is removed and the liquid shaken quickly and frequently, by which the pepsin is removed from solution by the cholesterin; afterwards filter, wash the filter with acid water and then with pure water, till the washings lose their acidity and reaction with nitrate of silver. Now in treating with ether, the cholesterin is dissolved whilst the adhering water forms an opaque layer with the pepsin, which is agitated repeatedly with fresh portions of ether, until nothing remains but an aqueous liquid from which the adhering ether passes off, and leaves a transparent solution of pure pepsin.

When acidulated with dilute hydrochloric acid, this liquid pos-

possesses energetic digestive properties, dissolving fibrine readily in an hour.

As has been remarked, that pepsic liquid is far from partaking of the reactions which are usually considered the characteristics of pepsin. Thus it is not affected by any of the reagents which indicate albumen, as per example by nitric acid, tincture of iodine, tannin and bichloride of mercury. This last point is of great importance, since the pepsin analyzed by M. Schmidt was prepared by precipitation with bichloride of mercury.

Nitrate of silver renders the liquid lightly opaline. Bichloride of platinum occasions a sensible troubling; it is precipitated abundantly by the acetates of lead, even in the presence of free acetic acid. It follows from this that our ideas of pepsin ought to be modified and its analysis made.—*Jour. de Pharm., Dec. 1862.*

THE BOSTON MEDICAL AND SURGICAL JOURNAL.

BOSTON: THURSDAY, APRIL 23, 1863.

DEATH OF DR. ROBERT WARE.—No sadder intelligence has come to us during the war than that contained in a solitary letter which made its way out by night from the little beleagured army at Washington, North Carolina, and reached here last week, bringing the information that the brave men, for whom we have all been so anxious, were still safe; but that one, Dr. Ware, of the 44th Mass. Vols., had died of lung fever, on the 10th inst., brought on or aggravated by overwork. Dr. Ware was the son of Dr. John Ware, of this city. He graduated at Cambridge in 1852, and from the Medical Department of the University in 1856, having spent a year of his student life in Europe with his father. For several years he had charge of the largest dispensary district in the city, and his death will be most sincerely mourned by the numerous poor, who never failed to recognize in him a conscientious and skilful helper in their troubles. We have repeatedly had opportunity during his absence to witness how spontaneous and universal was the expression of this feeling towards him by this class of our foreign population, who were so long the recipients of his professional kindness. It was something entirely exceptional, and speaks more eloquently of the man and physician than any words of praise which may be written in memory of him. With his professional brethren he bore the character of one modest, devoted to his art, and eminently gifted with sound judgment, and for these high qualities he gained the respect of all who knew him. To his friends he was the genial and amiable companion, fond of humor, and filled with pleasant knowledge drawn from his extensive general reading. His own contributions to medical literature were but few, for he had been so earnest a worker and observer that he had never found the time or will to write, but all knew that he too possessed to a remarkable extent that power of accurate observation and the mature judgment, which so eminently qualified his father for the position he so long and successfully filled, of Professor of the

Theory and Practice of Medicine in Harvard University. In the winter of 1860 and '61 he prepared for the Sanitary Association a most thorough report upon the epidemic of smallpox at that time prevalent in this city, which contained, also, a history of that disease and of Inoculation in New England from the time of its settlement. This memoir, with the valuable suggestions it contained, was considered of so great importance, that it was published by vote of the Legislature and distributed throughout the State. He also prepared, from time to time, for this JOURNAL, reports of medical cases occurring at the Massachusetts General Hospital, which were models of excellence in clearness and conciseness.

In the fall of 1861, he entered the service of the Sanitary Commission as inspector of hospitals and camps, and remained absent in the discharge of these duties until last summer, when he returned, and soon afterwards accepted the position of Surgeon to the 44th Massachusetts Volunteers. He remained with his regiment mostly in the vicinity of Newbern from its departure up to the present time, when we knew that it had been hemmed in at Washington by the rebels, earnestly devoted throughout to its interests; too much so, alas! for his and our advantage, for it was from too severe labors that he suddenly fell ill and died. No young man in our profession among us gave promise of a brighter future, and perhaps none other so fully as he possessed that rare combination of qualities so necessary to make a good and great physician.

It has so come to pass that within the last few weeks two of our most beloved and honored physicians have been called upon to resign forever the hopes and affections they had centred upon sons destined to sustain the name and reputation their fathers had gained in our community and profession. One of them had but just entered upon his medical studies, when a burning patriotism at once took him forth to battle for his country, and he fell, a gallant, brave and manly soul, far ahead of his troop, in his first charge upon the enemies of our country, grasping his unyielded sword even in death. The other, worn down by incessant labor in behalf of the noble band of young heroes committed to his professional charge, surrounded by a hostile army, fell too in harness, and died a patriot's death.

May their example stimulate the zeal of all who are engaged in the same holy cause, and may their families find some consolation for the sacrifice they have made for us in the sympathy which fills the hearts of all.

BOYLSTON MEDICAL SOCIETY.—The annual prize for the current year, for the best medical dissertation by an undergraduate, has been awarded to Mr. Norton Folsom, of Cambridge, for an essay on the senses of "Smell and Taste."

By order of the Prize Committee, DAVID W. CHEEVER, M.D.,
Boston, April 15, 1863. *President of the Society.*

We are pleased to learn that this old and established Society of Undergraduates in the Medical School of Harvard University is recovering its former size and usefulness. *Twenty-seven* new members have been added during the lecture season just passed, and we trust that it will continue to increase and extend its influences for medical improve-

ment among as many future classes of students as it has already done since its first organization, a half a century ago.

Mr. Folsom, the successful competitor for the prize, and whose essay we publish to-day, is a member of the present medical class, and has just been appointed one of the house-pupils at the Mass. Gen. Hospital. We are pleased to see this evidence of a spirit of original observation and experimentation among the students, for it has hitherto been inexcusably neglected among us in our system of medical education. The cadaver and text-book are not the only sources of information at command, and the study of physiology, as Mr. Folsom has so well demonstrated, may be pursued with advantage and credit by observations directed to the living animal.

MIDDLESEX SOUTH DISTRICT MEDICAL SOCIETY.—At a meeting of the Society, held at Waltham, April 15th, 1863, the following gentlemen were elected officers for the ensuing year:—*President*, Dr. John W. Osgood. *Vice President*, Dr. Theodore Kittredge. *Secretary*, Dr. Francis H. Brown. *Treasurer*, Dr. R. S. Warren. *Supervisors*, Drs. Samuel Richardson, Henry Bigelow, J. L. Sullivan. *Censors*, Drs. Morrill Wyman, Moses Clarke, J. H. Brown. *Commissioner on Trials*, Dr. Anson Hooker. *Councillors*, Drs. Josiah Bartlett, C. H. Allen, Enos Hoyt, J. B. Taylor, A. Mason, Henry Cowles, O. E. Hunt, A. B. Bancroft, A. C. Livermore, Howland Holmes, L. E. Partridge. *Essayist*, Dr. Alfred Hosmer. *Delegates to the American Medical Association*, Drs. W. W. Wellington, Moses Clarke, Enos Hoyt, Jefferson Pratt, Josiah Bartlett, Anson Hooker, Samuel Richardson, Alfred Hosmer, R. S. Warren.

FRANCIS H. BROWN, *Secretary*.

THE FLATHEAD INDIANS.—The Flatheads extend over a wide range of country from 130 miles up the Columbia river to its mouth, and along the Pacific coast and the Straits of De Fuca, Puget's Sound, and Canal Diablo to near the mouth of Frazer's river; as well as on Vancouver's Island. . . . During Mr. Paul Kane's travels among those tribes he saw hundreds of children undergoing the process of flattening the head, and thus describes the mode of procedure. The infant is strapped to the cradle-board, which is carefully covered with moss of finely frayed fibres of cedar-bark, and is fitted with a head-board which projects beyond the face, so as to protect it from injury. In order to flatten the head, a pad, made of a piece of skin stuffed with soft cedar-bark, is laid on the infant's forehead, and on the top of this a slab of hard bark, with the smooth side under. This is covered with a piece of pliant deer-skin, and is bound tightly by means of a leathern band passing through holes in the cradle-board, while the head is supported and kept in an immovable position by a pillow of grass or frayed cedar-bark placed under the back of the neck. This process commences immediately after the birth of the child, and is continued for a period of from eight to twelve months, by which time the head has assumed the flattened or wedge-shaped form, which constitutes the ideal of Chinook or Cowlitz grace. Another process is by means of a square piece of leather, with thongs attached to the four corners, placed over a pad on the forehead, and secured tightly to the board. Other pads are placed under the head, and at its sides, according to the special form which it is desired to give it. Mr. Kane remarks: "It might be sup-

posed, from the extent to which this is carried, that the operation would be attended with great suffering, but I have never heard the infants crying or moaning, although I have seen the eyes seemingly starting out of the sockets from the great pressure. From the apparent dulness of the children whilst under the pressure, I should imagine that a state of insensibility is induced, and that the return to consciousness occasioned by its removal, must be naturally followed by the sense of pain." The brain in its process towards maturity seems partially to recover a less abnormal form, especially where the pressure has been applied so as to produce the elevated wedge shape, with the breadth of the whole mass presented in front and rear. Mr. Kane was led to the conclusion that this violent process in no degree injures the health, as from inquiries made by him it did not appear that the mortality among the Flathead children is greater than among other Indian tribes. The evidence that it leaves the intellect unimpaired rests on more absolute proof. The Flathead tribes are in the constant habit of making slaves of the neighboring roundheaded Indians, whom they treat with great barbarity; and though living among them, these are not allowed to flatten or modify the form of their infants' heads, that being a distinguished mark of freedom, and a badge of aristocratic descent. They look with contempt on the whites as a people who bear in the shape of their heads the hereditary mark of slaves. They are, moreover, acute and intelligent, have singular powers of mimicry, and have been noted for very retentive memories: being capable of repeating passages of some length, and with considerable accuracy, when recited in their hearing. It would, indeed, appear, that alike in the time of Hippocrates and in our own day, an idea has prevailed among those who practised the strange barbarian usage of remodelling the human head, that they thereby not only conferred and added grace to its form, but that they contributed no less to the mental superiority of those among whom this has ever been the peculiar symbol of aristocracy, and the mark of the dominant race. If it did, in reality, produce an opposite effect, and tend either to mental inferiority or absolute insanity, it would lead to speedy and inevitable revolutions among those tribes where the helots are rigorously excluded from the practice. But neither among the Peruvians, nor the ancient or modern North American tribes, is there any evidence of the normal cranium having thus practically demonstrated its superiority over the deformed or flattened skull.—*Prehistoric Man*, by DANIEL WILSON, LL.D.

CANADA LANCET.—The arrival of the second number of this new journal reminds us that we have been somewhat tardy in announcing its appearance to our readers. It is to be published monthly in Montreal, under the editorship of Dr. William E. Bowman, and, as the only medical periodical at present published in the British Provinces, we hope it will receive the support and success the attempt deserves.

APPLICATION OF MAGENTA DYE IN MICROSCOPICAL INVESTIGATIONS.—At a recent meeting of the Microscopical Section of the Literary and Philosophical Society of Manchester, Dr. Roberts called attention to the aid that might be received in the examination of the structure of animal and vegetable tissue by the use of coloring materials. Magenta is peculiarly adapted for this purpose, in consequence of its solubility

in simple water and its inert chemical character. The nuclear structures of animal cells are deeply tinted by Magenta; and by its use the nuclei of the pale blood corpuscles, of pus globules, of the renal and hepatic cells, and of all epithelial structures, are brought out in great beauty, tinted of a bright carbuncle-red. The red blood disks are tinted of a faint rose-color, and a darker red speck, not hitherto noticed, is to be observed on the periphery of the corpuscle: it undergoes some change when treated with tannin and subsequently with caustic potash, but this point is still under investigation.—*Annales and Magazine of Natural History*.

NEW USE FOR BENZINE.—Benzine, which has been found in abundance for some years, in commerce, possesses, like other volatile and fatty oils, the property of giving to paper a decided transparency, which disappears after the evaporation of the liquid. This property enables one to avoid the use of tracing paper for drawing or designs. It is only necessary to spread upon the object to be copied an ordinary sheet of paper, and to wet with benzine, by means of a sponge, the place that one wishes to trace, to render this place transparent, and to be able to trace upon it with a pencil and India ink, the design that can be distinctly seen beneath it. The benzine immediately and entirely evaporates, without leaving any trace, and the paper becomes opaque. The original design, moreover, is by no means hurt. As to the odor, which is not absolutely disagreeable, provided the liquid is not too impure, the paper can be freed from it in a few hours, provided that care is taken to air and heat it. We are indebted to Prof. M. Oelschläger for the discovery of this process.—*Journal de Chimie Médicale*, January, 1863.

A SYMPTOM OF FRACTURE OF THE BASE OF THE SKULL.—In a communication made to the Surgical Society of Paris, M. Dolbeau has called attention to the presence of ecchymosis of the pharynx at its upper part as a sign of fracture of the base of the skull. In a case admitted into the Bicêtre, where death took place twelve days after the receipt of the injury, the patient complained, when sensible, of pain in swallowing. On examination after death, the base of the skull was found fractured; and there was infiltration of blood behind the pharynx, from the occipital bone to the second cervical vertebra; the mucous membrane of the pharynx was also evidently ecchymosed. In two other cases in which the symptoms pointed to injury of the base of the skull—contusion in one, and fracture in the other—and in which recovery took place, pain in deglutition was complained of; and, on examination, in each case there was found to be ecchymosis of the posterior wall of the pharynx. The portion of the pharynx in which the ecchymosis occurs is rather difficult to be seen: it is limited by the bone of the skull above and the velum palati below, by the vertebral column behind, and the posterior orifice of the nares in front.—*British Medical Journal*, June 7, 1862, from *Presse Méd. Belge*, 27 Avril, 1862.

BROMIDE OF AMMONIUM—HYDROBROMATE OF AMMONIA.—At the late meeting of the British Association for the Advancement of Science, held at Cambridge, a paper was read by Dr. Gibb, "On the Physiological Effects of the Bromide of Ammonium." He said that, "although

not complete, his experiments were sufficiently positive in their results to justify him in bringing the subject before the Association."

This salt, he stated, had a tonic, sedative, or antispasmodic action, according to the quantity given and the mode of administration; and the structures affected by it were the skin and mucous membrane, and fatty compounds. In producing anæsthesia of the fauces, it was superior to the bromide of potassium, and possessed the power of diminishing fat in the economy, and influencing the arrest of atheromatous changes; and he thought it would ultimately be found of more value for the reduction of corpulency and allied states than any other substance at present known. It has been found to be very useful in some of the milder forms of skin disease, and of equal value with the bromide of potassium as an absorbent in glandular and other enlargements, and superior to it, in some respects, in the treatment of some other forms of disease. Dr. Gibb has also employed it in epilepsy with marked benefit, and also in cases of strumous ophthalmia in the young. Bromide of ammonium is a white prismatic salt, becoming yellow and slightly acid by exposure to air. It is very soluble in water, but only sparingly soluble in alcohol. It is composed of one atom each of bromine and ammonium.

DR. E. R. JAMESON, of Woburn, late Hospital Steward of the Mass. 11th Regiment, has been appointed Assistant Surgeon of the Mass. 54th (colored) Regiment, now at Readville.

VITAL STATISTICS OF BOSTON.

FOR THE WEEK ENDING SATURDAY, APRIL 18th, 1863.

DEATHS.

	Males.	Females.	Total.
Deaths during the week	33	34	67
Ave. mortality of corresponding weeks for ten years, 1853-1863,	36.6	39.7	76.3
Average corrected to increased population	00	00	84.09
Death of persons above 90	0	2	2

Mortality from Prevailing Diseases.

Phthisis.	Croup.	Scar. Fev.	Pneumon.	Variola.	Dysentery.	Typ. Fever.	Diphtheria.
15	2	4	5	0	0	1	1

COMMUNICATIONS RECEIVED.—From Dr. J. B. Upham, Dr. John Stearns, Dr. B. Joy Jeffries, and Dr. D. W. Cheever.

BOOKS AND PAMPHLETS RECEIVED.—Eighth Annual Report of the Births, Marriages and Deaths in the city of Providence, R. I., for 1862. By Edwin M. Snow, M.D. Second Edition. (From the Author.)—Physiological Memoirs. By William A. Hammond, M.D., Surgeon-General, U. S. Army. 8vo. Pp. 348. Philadelphia, J. B. Lippincott & Co. 1863. (From the Publishers.)—Sanitary Commission. Supplement to Report concerning aid and comfort given to sick soldiers passing through Washington. By F. N. Knapp, Special Relief Agent.—Second Report to the Committee of the Sanitary Association on the General Hospitals of the Army. By H. G. Clark, M.D., Inspector-in-Chief. (From the Author.)

JOURNALS RECEIVED.—The Cincinnati Lancet and Observer, April, 1863.—Canda Lancet, vol. i., No. 2.—American Medical Times, vol. vi., No. xiv.—Cincinnati Medical and Surgical News, April, 1863.

DEATHS IN BOSTON for the week ending Saturday noon, April 18th, 67. Males, 33—Females, 34.—Accident, 1—apoplexy, 2—inflammation of the bowels, 1—congestion of the brain, 3—softening of the brain, 1—carbuncle (on neck), 1—consumption, 15—convulsions, 1—croup, 2—cyanosis, 1—debility, 1—diphtheria, 1—dropsy, 2—dropsy of the brain, 3—drowned, 1—scarlet fever, 4—typhoid fever, 1— hæmoptysis, 2—infantile disease, 5—intemperance, 1—inflammation of the lungs, 5—marasmus, 3—old age, 3—paralysis, 1—premature birth, 2—scrofula, 1—sore throat, 1—tubercles mesenterica, 1—unknown, 1.

Under 5 years of age, 31—between 5 and 20 years, 9—between 20 and 40 years, 13—between 40 and 60 years, 7—above 60 years, 7. Born in the United States, 50—Ireland, 14—other places, 3.